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6. ENVIRONMENTAL IMPACTS OF TRANSPORTATION

This chapter describes the potential environmental consequences of transporting the spent nuclear fuel and high-level radioactive waste described in Chapter 2 and Appendix A from 72 commercial and 5 U.S. Department of Energy (DOE, or the Department) sites to the Yucca Mountain site under the Proposed Action. This chapter also separately describes the potential impacts of transportation activities in the State of Nevada.

On a national basis DOE analyzed impacts of transporting spent nuclear fuel, including potential commercial spent mixed-oxide fuel containing surplus plutonium that originated from U.S. defense programs, and high-level radioactive waste, including high-level radioactive waste that could contain immobilized surplus plutonium from U.S. defense programs. These impacts include all activities necessary to transport these materials, from loading at the commercial and DOE facilities to delivery at the Yucca Mountain site. In addition, although DOE would prefer that most shipments be carried out by rail, the analysis addressed two scenarios—*mostly legal-weight truck* and *mostly rail*. These two scenarios allowed the analysis to encompass the range of potential impacts for any mix of truck and rail shipments that would actually occur. Because naval spent nuclear fuel would not be shipped by legal-weight truck (DIRS 101941-USN 1996, all) and not all of the generator sites can handle rail casks, the national scenarios involve the use of mostly legal-weight truck shipments (with only naval spent nuclear fuel being transported by rail) or mostly rail shipments (with transportation of some commercial spent nuclear fuel by truck). In addition, as part of the mostly rail scenario, the analysis assessed impacts of short hauls of commercial spent nuclear fuel in heavy-haul trucks or barges from some commercial sites to nearby railheads.

For the discussion of potential impacts of transportation by truck or rail in Nevada, such impacts would be a subset of the impacts of potential national impacts. They are discussed separately so they can be compared to a third mode of transportation, the use of heavy-haul trucks, for spent nuclear fuel and high-level radioactive waste that would arrive in Nevada by rail. Thus, the analysis considered three alternative modes of transportation for shipments once they would arrive in Nevada: (1) for those arriving by legal-weight truck, continuing the shipments by legal-weight truck to the Yucca Mountain site; (2) for those arriving by train, continuing the shipments by rail using a branch rail line in one of five candidate rail corridors to the site; or (3) for those arriving by rail, unloading the shipments from railcars and loading them on heavy-haul trucks at an intermodal transfer station for shipment to the site on one of five candidate highway routes. Figure 6-1 shows these three options. The candidate highway routes for heavy-haul trucks and rail corridors for a potential branch rail line are called *implementing alternatives*. Figure 6-2 shows the transportation implementing alternatives and their relationships to the national and Nevada transportation scenarios and to the mix of rail and legal-weight truck transportation modes that make up each scenario.

Section 6.1 summarizes both national and Nevada transportation activities. Chapter 2, Section 2.1.3, also describes national and Nevada transportation activities. Section 6.2 assesses the potential impacts of national transportation from the 77 sites to Yucca Mountain. Section 6.3 assesses potential impacts from transportation activities in Nevada. Chapter 2 describes the receipt and unloading of shipping casks at the repository (Section 2.1.2.1.1.1), the preparation of empty casks for reshipment (Section 2.1.2.1.1.3), and the potential construction and operation of a cask maintenance facility (Section 2.1.3.4). Chapter 4, Section 4.1.15, evaluates potential environmental impacts from the offsite manufacturing of shipping casks for commercial spent nuclear fuel and DOE spent nuclear fuel and high-level radioactive waste. Chapter 8, Section 8.4, discusses cumulative impacts of transportation for the Proposed Action and anticipated future radioactive material transportation activities. Appendix J contains details on transportation analysis methods and results. Appendix M provides information that is not needed to evaluate environmental impacts but that could be useful to readers to gain an understanding of nuclear waste transportation.

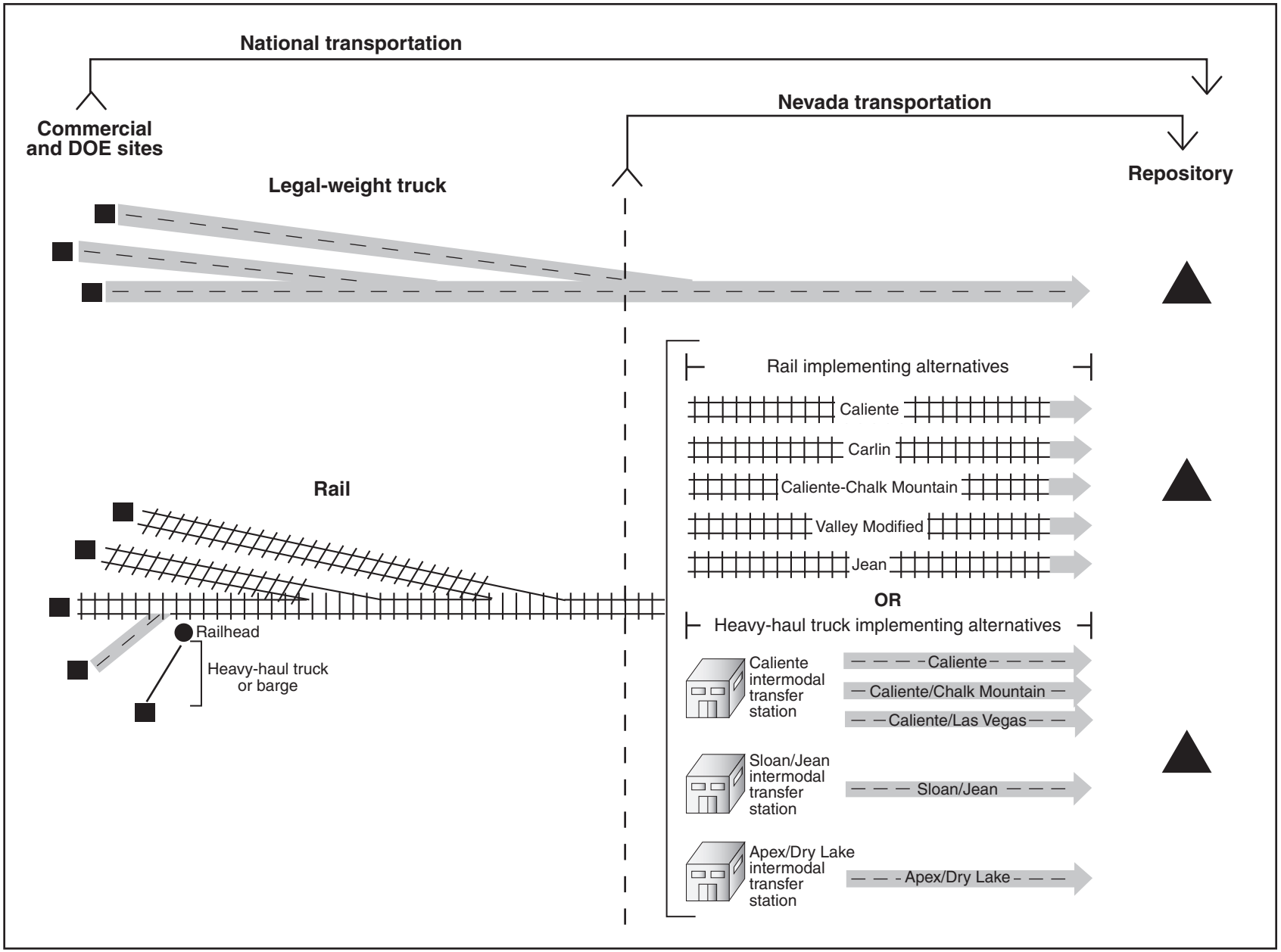
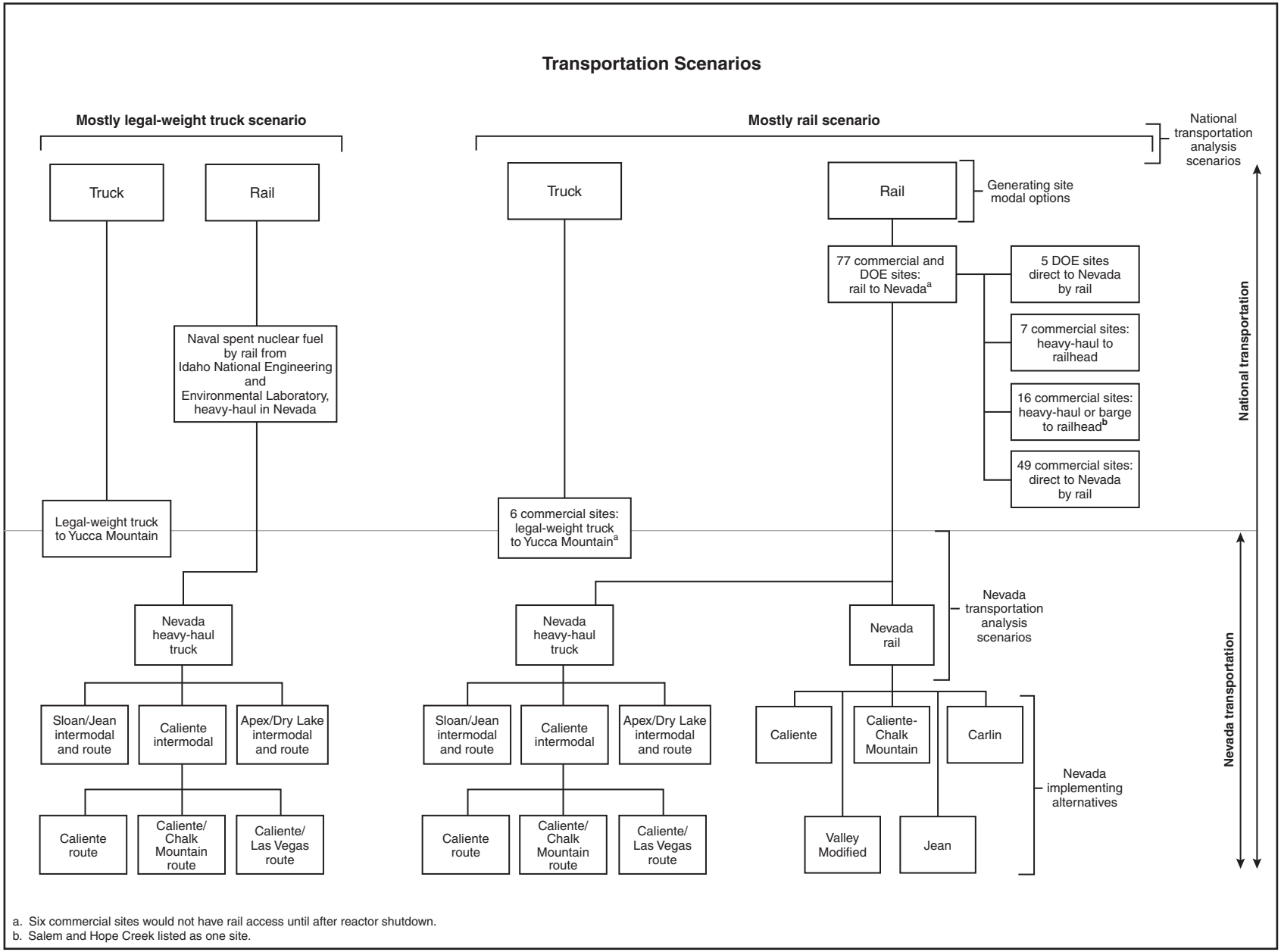


Figure 6-1. Relationship of Nevada and national transportation.



a. Six commercial sites would not have rail access until after reactor shutdown.
b. Salem and Hope Creek listed as one site.

Figure 6-2. Relationship between transportation modes, national and Nevada analytical scenarios, and Nevada transportation implementing alternatives.

CHANGES SINCE THE PUBLICATION OF THE DRAFT EIS

Changes in Information, Analytic Tools, and Assumptions

Since the publication of the Draft EIS, DOE has acquired new information and analytic tools that contribute to an improved understanding of interactions between the potentially affected environment and transportation activities necessary for the Proposed Action, including information and suggestions for improvements provided in public comments on the Draft EIS and on the Supplement to the Draft EIS. As a consequence, the impacts described in this chapter, Appendix J, and other transportation-related sections of this Final EIS differ from those described in the Draft EIS.

Notably, estimates of total impacts to public health and safety described in this chapter are smaller than those in the Draft EIS. With the exception of consequences of postulated acts of sabotage, estimates for radiological impacts of *incident-free transportation* and accidents and consequences of maximum reasonably foreseeable accidents are all smaller than the estimates in the Draft EIS. The nonradiological impacts reported in this Final EIS are approximately the same as those in the Draft EIS, including those in the Supplement to the Draft EIS. Differences in estimates of transportation-related impacts for land use; air quality; hydrology; biological resources and soils; cultural resources; socioeconomics; noise; aesthetics; waste management; utilities, energy, and materials; and environmental justice are principally the result of new information that enabled better representation of impacts that were, for the most part, identified in the Draft EIS and, for land use, changes in the affected environment that occurred after the publication of the Draft EIS. The following paragraphs describe the changes that had the most effect on the impact results, including comparisons with the results presented in the Draft EIS.

Estimated Numbers of Shipments. Estimates of the number of shipments of commercial spent nuclear fuel that would be made under the mostly legal-weight truck and mostly rail scenarios were based on a version of the CALVIN computer program (DIRS 155644-CRWMS M&O 1999, all) that has been updated from the version used for the Draft EIS. The updated version of CALVIN (Version 2.0) incorporates a number of changes, including: (1) revised estimates of future generation of commercial spent nuclear fuel; (2) revised estimates of the capabilities of commercial generator sites to handle and load large shipping casks; (3) revised estimates of the types and sizes of shipping casks that would be used; and (4) revised assumptions about how sites would select spent nuclear fuel assemblies for delivery to DOE.

The Final EIS analyses used a total of about 53,000 legal-weight truck shipments and 300 rail shipments of naval spent nuclear fuel for the mostly legal-weight truck scenario. This is an increase of about 3,000 shipments or 6 percent over the approximately 50,000 shipments reported in the Draft EIS. This increase is the result of slight changes in the assumed characteristics of spent nuclear fuel that commercial generators would deliver to DOE.

For the mostly rail scenario, the total number of shipments in the Final EIS analyses is about 10,700. About 1,100 of these shipments would be by legal-weight truck. The Draft EIS used a total of about 13,400 shipments (about 25 percent more), of which about 10,800 would be by rail and 2,600 by legal-weight truck. The reduced number of shipments is a result of changes in assumptions regarding the size of shipping casks and the capabilities of generator sites to handle and load rail casks. For this scenario, based on information available from industry sources following the publication of the Draft EIS, the updated CALVIN analysis assumed three generator sites previously considered capable of handling and loading only legal-weight truck casks could handle and load rail casks. In addition, the analysis assumed that the remaining truck-only sites would be capable of handling and loading rail casks following permanent shutdown of the sites' reactors.

Based solely on changes in the number of shipments, estimates of health and safety impacts nationally and in Nevada are 6 percent greater for the mostly legal-weight truck scenario and about 25 percent less for the mostly rail scenario than those reported in the Draft EIS. The change in the number of shipments would not cause discernible changes in impacts in other resource areas discussed in this chapter.

Characteristics of Commercial Spent Nuclear Fuel Used in Accident Analyses. The transportation analysis used the characteristics of representative spent nuclear fuel described in Appendix A, rather than the characteristics of typical (or average age) spent nuclear fuel used in the Draft EIS, to evaluate potential impacts and consequences of transportation accidents. Representative spent nuclear fuel is commercial spent nuclear fuel with a health and safety hazard that is the average of all the spent nuclear fuel that would be shipped to the proposed repository. Under this averaging, representative spent nuclear fuel would be (1) spent nuclear fuel from a pressurized-water reactor that had been discharged from a reactor for 15 years and had an average burnup of 50,000 megawatt-days per metric ton of heavy metal (MTHM), or (2) spent nuclear fuel from a boiling-water reactor that had been discharged for 14 years with a burnup of 40,000 megawatt-days per MTHM. Conversely, typical pressurized-water reactor spent nuclear fuel (also described in Appendix A) has been discharged from a reactor for 25.9 years with a burnup of almost 40,000 megawatt-days per MTHM. Typical boiling-water reactor spent nuclear fuel has been discharged from a reactor for 27.2 years with a burnup of about 32,000 megawatt-days per MTHM. DOE made the change to a representative fuel for accident analysis because it determined that estimates of accident risk using the characteristics of the typical spent nuclear fuel discussed in the Draft EIS underestimated the accident risk of shipments. This change in the analysis resulted in about a twofold increase in the estimated inventory of primary radionuclides in each shipping cask in comparison to the estimates in the Draft EIS. Primary radionuclides are those that contribute the most to impacts (see Appendix J, Section J.1.3.1).

Highway and Rail Routes. The analyses of transportation impacts in the Draft and Final EIS used the HIGHWAY (DIRS 104780-Johnson et al. 1993, all) and INTERLINE (DIRS 104781-Johnson et al. 1993, all) computer programs to identify routes that DOE could use for shipments from 77 generator sites to a Yucca Mountain Repository. DOE believes that the identified routes are representative of those that would be used if the Yucca Mountain site was approved and a repository was constructed and operated.

IDENTIFICATION OF TRANSPORTATION ROUTES

DOE has published proposed policy and procedures (63 *FR* 23756; April 30, 1998) "setting forth its revised plans for implementing a program of technical and financial assistance to states for training public safety officials of appropriate units of local government and to Indian tribes through whose jurisdictions the Department plans to transport spent nuclear fuel or high-level radioactive waste." The proposed policy and procedures state that DOE "plans to identify preliminary routes [that the Department] anticipates using within state and tribal jurisdictions when it notifies governors and tribal leaders of their eligibility." Notification would begin "approximately five years prior to transportation through" affected jurisdictions.

Most of the routes used for analyses in the Final EIS did not change from those used for the Draft EIS. However, railroad consolidations and alternative preferred routes designated by states for highway shipments resulted in changes in some of the routes identified by the computer programs and used in the analyses. For example, railroad consolidation led to a change in a potential *rail route* from the Monticello generator site in Minnesota. This caused the State of South Dakota, which was not included among the states crossed by routes analyzed in the Draft EIS, to become one of the states through which the analysis assumed shipments would travel.

In the case of highway shipments, new information published by the U.S. Department of Transportation (65 *FR* 75771; December 4, 2000) lists 14 states that have designated preferred routes for truck shipments of Highway Route-Controlled Quantities of Radioactive Materials. The Draft EIS listed 10 states based on information available at the time. The four added states are Delaware, Ohio, Texas, and Utah. Also listed for the first time in an integrated source are route restrictions and preferred route designations made by the State of Colorado that would preclude the use of Interstate Highway 70 west of Denver to the Utah border. The new information resulted in changes in the routing that the Draft EIS analysis assumed for some shipments.

Overall, the effects of changes in the routes used in the analysis on estimated impacts would be small for national transportation. However, DOE has added maps and tables that show the routes that were analyzed and the estimated health and safety impacts for each state through which shipments would pass if these routes were used (Appendix J, Section J.4).

Bureau of the Census Data. The analyses in the Draft and Final EIS used the HIGHWAY and INTERLINE computer programs to develop estimates of potentially affected populations along transportation routes. These programs use block group data from the 1990 Census. The Draft EIS used estimates of population along routes provided by these programs to estimate radiological impacts of transportation nationally and in Nevada. In a change from the Draft EIS, the Final EIS analysis used projections for each state made by the Bureau of the Census for population growth to 2025, results of the 2000 Census, and extrapolation to estimate populations along routes in 2035. These estimated population increases were used in estimating radiological health and safety impacts for national transportation.

In another change, estimates of populations along potential routes in the State of Nevada incorporate information developed using a geographic information system, 1990 Census data, and projections to 2035 obtained using the REMI computer program. Projections using REMI were based on forecasts provided to DOE by Clark County, Nye County, and the Nevada State Demographer, anchored to the results of the 2000 Census for Nevada counties. In addition, population estimates for routes that include the planned Las Vegas Beltway used a forecast for 2020 provided by a report prepared for the City of North Las Vegas (DIRS 155112-Berger 2000, all).

The overall effect of these changes is that estimated affected populations along national routes would be about 40 percent greater than the populations estimated with the use of 1990 Census data, as used in the Draft EIS. The Nevada population used in the analysis of transportation-related health and safety impacts in this Final EIS is about 100 percent greater than that used in the Draft EIS.

DOE conducted a limited sensitivity analysis of national transportation impacts using route population information based on projections provided by the TRAGIS computer program (DIRS 157136-Johnson and Michelhaugh 2000, all). The TRAGIS program, which DOE released in the Fall of 2001 to replace the HIGHWAY and INTERLINE computer codes used for the transportation analyses in this EIS, uses 2000 Census data to develop population estimates for routes. Based on the sensitivity analysis performed using TRAGIS in place of HIGHWAY, DOE determined that doses to the general public from incident-free transportation would be similar to (about 10 percent greater than) those reported in this chapter.

Performance of Shipping Casks in Transportation Accidents. DOE has revised the transportation accident analyses in the EIS to reflect new information. For example, since the publication of the Draft EIS, the Nuclear Regulatory Commission published *Reexamination of Spent Fuel Shipment Risk Estimates* (DIRS 152476-Sprung et al. 2000, all). Based on the analyses in that report, DOE concluded that the models used for analysis in the Draft EIS relied on assumptions about spent nuclear fuel and cask response to accident conditions that caused an overestimation of the resulting impacts. For example, the analyses in the Draft EIS were based on *Shipping Container Response to Severe Highway and Railway*

***Assessment of the Hazards of Transporting Spent Nuclear Fuel and High-Level Radioactive Waste to the Proposed Yucca Mountain Repository Using the Proposed Northern Las Vegas Beltway* (DIRS 155112-Berger 2000, all)**

The transportation analyses in the Final EIS used some information from this document. DOE considers this report to be the only available source of some information, but is in broad disagreement with the analyses and conclusions regarding the report's estimates of impacts.

Useful information not available elsewhere includes:

- An estimate of population along the Las Vegas Beltway—an area that is currently mostly uninhabited—although, as discussed below, DOE believes the estimate is high.
- New information regarding the expected cost to construct the beltway.
- A scenario for estimating dose to a maximally exposed individual along a highway route used by heavy-haul trucks in Nevada.

DOE disagrees with some aspects of the report for a variety of reasons, including:

- The projected population growth within 3.2 kilometers (2 miles) of the 21-kilometer (13-mile)-long Northern Beltway appears to be very high, accounting for 42 percent of population growth projected by a University of Nevada Las Vegas report (DIRS 156031-Riddel and Schwer 2000, Table 1) for all of Clark County during the same period.
- The report uses a very high accident rate as a basis for accident probabilities. This rate—4 times that reported to DOE by the State of Nevada for interstate trucks on all Nevada highways (see Appendix J, Section J.1.4.2.3.3)—is 17 times greater than the rate DOE used in the EIS, which is based on statistics compiled by the U.S. Department of Transportation. The rate could be higher in part because it was based on the State of Nevada definition of an accident rather than the Department of Transportation definition recommended by the National Governors Association (see Sections J.1.4.2.3 and J.1.4.2.3.3). In addition, the rate used in the report appears to be an intercity rate (urban interstate) that does not accurately reflect the accident rate for highways in Nevada that shipments to Yucca Mountain would use.
- The report projects economic impacts in the Northern Beltway area assuming that business location decisions would be made solely on whether shipments of spent nuclear fuel and high-level radioactive waste would use the Northern Beltway. The report did not consider many other factors commonly associated with such decisions.
- The report overestimates economic impacts to Clark County under the implied assumption that not only would some companies not locate near the Northern Beltway because of shipments of spent nuclear fuel and high-level radioactive waste, these companies would not locate anywhere in Clark County; and that existing Clark County companies that could move to the Northern Beltway area would actually leave Clark County. The report ignores statistics that show that many business relocations occur in the same county. In addition, the report fails to recognize that decisions to remain at the same location would have no economic impact on the county.

Accident Conditions, which estimated that 99.4 percent of accidents would not lead to a release of radioactive materials from a shipping cask (DIRS 101828-Fischer et al. 1987, pp. 4-8, 7-25, and 7-26). Based on the revised analyses, casks would continue to contain spent nuclear fuel fully in more than 99.99 percent of all accidents (DIRS 152476-Sprung et al. 2000, p. 7-73 to 7-76). In addition, based on that report, DOE has included impacts of an accident in which the radiation shielding of a shipping cask

would be damaged—so-called *loss-of-shielding* accidents. DOE also included estimated impacts of 99.99 percent of accidents in which the cask's containment and shielding would not be damaged by the accident but where nearby populations could be exposed to low-level radiation during the time it would take for accident response and recovery. The analysis assumed the low-level radiation would be the maximum allowed by regulation for a cask transporting spent nuclear fuel or high-level radioactive waste. The Draft EIS did not include these evaluations.

The collective effect of these changes was a significant reduction in estimated consequences of maximum reasonably foreseeable accidents and estimates of accident risk from those presented in the Draft EIS. In addition, the use of information from the DIRS 152476-Sprung et al. (2000, all) report permits a better description of the maximum reasonably foreseeable accidents analyzed. For example, the characteristics of the maximum reasonably foreseeable accident analyzed in this chapter for rail transportation correspond closely to reported conditions in the Baltimore Tunnel train accident fire in July 2001 (DIRS 156753-Ettlin 2001, all; DIRS 156754-Rascovar 2001, all).

Model for Estimating Doses to the Public at Truck Stops. The Draft EIS used information reported in DIRS 101888-Neuhauser and Kanipe (1992, p. 3-29) to estimate the radiation dose that would be received by members of the public at rest stops used by trucks carrying spent nuclear fuel and high-level radioactive waste. The time allocated to stops in the report is equivalent to about 1 hour of stop per hour of travel—a significant overestimate of stop time in real truck transport operations involving team drivers. As a consequence, more than 90 percent of the dose to the general public reported for the mostly legal-weight truck scenario in the Draft EIS was based on this estimate of dose to persons at truck stops.

The analysis in this Final EIS used more recent data based on field observations of truck stop time (DIRS 152084-Griego, Smith, and Neuhauser 1996, all). In addition, the analysis estimated doses to populations in areas surrounding stops, including estimates of stop time for state inspections and periodic driver walk-around, which were not part of the analyses in the Draft EIS. The analysis concluded that the average time trucks would stop would be about 1 hour for every 10 hours of travel, which resulted in a much lower estimate for radiation dose to the general public. Appendix J, Section J.1.3.2.1 provides additional information.

RADTRAN. DOE used the RADTRAN 4 computer program in estimating the radiological incident-free and accident risk impacts in the Draft EIS. For this Final EIS, DOE used an updated version of the program, RADTRAN 5, which allowed more complex analyses of impacts, such as those involving models used to estimate doses to persons at truck stops. With the exception of the improvements in capabilities afforded by RADTRAN 5, the analytical methods used by the two programs to estimate impacts to populations are largely the same. This change had no effect on the results.

Health Effect Fatality Impacts of Vehicle Emissions. New information used to estimate fatalities from health effects of vehicle emissions (DIRS 151198-Biwer and Butler 1999, all) became available following the publication of the Draft EIS. DOE used this information in conjunction with information from the Environmental Protection Agency (DIRS 155780-EPA 1993, all; DIRS 155786-EPA 1997, all) to develop risk factors for the analysis in this Final EIS. Based on this new data, estimates of impacts from vehicle emissions are about 3 times greater than the estimates in the Draft EIS, which ranged from 0.2 to 0.6 fatalities over 24 years.

First Responder. The analyses of transportation impacts in this Final EIS included estimates of doses to maximally exposed individuals not identified in the Draft EIS. These included estimates of doses to a first responder at a transportation accident and individuals who resided close to highways or rail routes in the State of Nevada.

Socioeconomic Baseline for Nevada Counties. The analyses of socioeconomic impacts in the Draft and Final EIS used baseline data developed using the REMI computer program. However, input parameters to calculations performed using REMI were adjusted for the Final EIS so predicted results reflect similar forecasts provided by Clark and Nye Counties and the Nevada State Demographer. The resultant changes in estimated socioeconomic impacts are small.

Time to Construct a Branch Rail Line. After the publication of the Draft EIS, the estimated time to construct a branch rail line to the Yucca Mountain site changed from 2.5 years (30 months) to 40 to 46 months, depending on the corridor. However, engineering estimates of materials and labor required for construction did not change, and therefore the constant-dollar cost estimates did not change. The changes in projected construction schedules led to lower estimates for socioeconomic impacts of constructing and operating a branch rail line in Nevada than those in the Draft EIS.

Cost to Construct the Las Vegas Beltway. The EIS includes estimates of socioeconomic impacts of using heavy-haul trucks on three candidate routes that include the planned Las Vegas Beltway. The analysis in the Draft EIS assumed an expenditure of $40 million (1998 dollars) for the northern segment of the Beltway, occurring between 2007 and 2010 rather than between 2010 and 2020 as planned by Clark County. The Draft EIS analysis also assumed a corresponding total of $90 million (1998 dollars) for the southern and western segments of the Beltway. An estimate in a City of North Las Vegas-sponsored report suggests the cost of completing the Northern Beltway between 2010 and 2020 could be as much as $425 million in 1998 dollars (DIRS 155112-Berger 2000, p. 29) ($463 million in 2001 dollars). DOE adopted this estimate for use in estimating socioeconomic impacts for the Caliente/Las Vegas and Apex/Dry Lake routes for heavy-haul trucks evaluated in this chapter. Using the same information, the analysis in this chapter estimated socioeconomic impacts for a Jean route for heavy-haul trucks with the assumption that the corresponding costs to complete the southern and western segments of the Beltway could be as much as $790 million. Because it assumed these larger estimated costs, the estimated socioeconomic impacts in Clark County for the Jean, Apex/Dry Lake, and Caliente/Las Vegas routes for heavy-haul trucks are higher in this Final EIS than those in the Draft EIS, but remain low for the County.

Potential Land-Use Conflicts for Construction and Operation of a Branch Rail Line in Nevada. After the publication of the Draft EIS, changes occurred in ownership and use of lands that a branch rail line in the candidate rail corridors in Nevada could cross. Land that could be crossed by the Bonnie Claire Alternate of the Caliente and Carlin Corridors has been transferred by an Act of Congress to the Timbisha Shoshone Tribe; land at the junction of the Stateline Pass Option of the Jean Corridor and the Union Pacific Railroad has been transferred by an Act of Congress to Clark County for development of the Ivanpah Valley Airport; and land near the junction of the Valley Modified Corridor and the Union Pacific Railroad has been transferred by the Bureau of Land Management to Clark County for the Apex Industrial Park. These changes result in potential land-use impacts for the affected corridors.

Changes Due to Public Comments. In response to interest and suggestions by the public and to better describe potential impacts of transportation alternatives in Nevada, DOE has modified analyses and presentations of impacts. The following are examples of such modifications:

- *Land-use and ownership.* Added available descriptive details and assessed potential impacts to wilderness study areas; grazing allotments; rights-of-way; and Bureau of Land Management, private, Nellis Air Force Range (now called the Nevada Test and Training Range), Native American, and Nevada Test Site lands along Nevada rail corridors, including variations, and along routes for heavy-haul trucks.

- *Air quality (nonradiological).* Provided more complete quantitative estimates of carbon monoxide and PM_{10} emissions from transportation activities, particularly in the Las Vegas Valley nonattainment area.

- *Hydrologic resources.* Expanded flood zone, groundwater, and surface-water resources, and water demand analyses to incorporate information for variations of Nevada rail corridors and for routes for heavy-haul trucks.

- *Biological resources and soils.* Provided more details from existing information and analyses of disturbed areas, sensitive biological resources, management areas, and soil impacts.

- *Cultural resources.* Acquired and evaluated additional cultural, archeological, and Native American data and included evaluations of potential impacts of Nevada rail variations and heavy-haul truck routes.

- *Socioeconomics.* Updated socioeconomic baseline information to accommodate 2000 Census information as well as match population forecasts provided by Clark and Nye Counties and Nevada State Demographer.

- *Noise and vibration.* Added new data and developed additional analyses of impacts of ground vibration and noise on *sensitive structures,* populations, and communities along Nevada rail corridors and routes for heavy-haul trucks.

- *Aesthetics.* Incorporated field observations made after the publication of the Draft EIS for viewsheds along candidate rail corridors and routes for heavy-haul trucks and used additional detail available from existing information.

- *Environmental justice.* Added available detail, reanalyzed data on minority and low-income populations, and reevaluated impact assessments of other disciplines.

- *Utilities, energy, and materials.* Reanalyzed impacts based on new information for the repository flexible design and for variations in the candidate rail corridors.

- *Waste management.* Added new waste data, details of waste sources and shipments, and changes in waste management from changes in information regarding the repository flexible design.

Other Changes

In addition to the changes described above, DOE added Appendix M to provide general background information on transportation-related topics that are not addressed in detail in this chapter or Appendix J and are not directly related to potential impacts of the Proposed Action. This includes information on the Department's planning, under a draft Request for Proposal, to issue shipping contracts and discussion of in-transit procedures, emergency response plans, indemnification against damages from the potential release of spent nuclear fuel and high-level waste, and cask testing.

6.1 Summary of Impacts of Transportation

6.1.1 Overview of National Transportation Impacts

This section provides an overview of the potential impacts of using the Nation's highways and railroads to transport spent nuclear fuel and high-level radioactive waste from 72 commercial and 5 DOE sites to the repository at Yucca Mountain. Detailed discussions of national transportation impacts are in Section 6.2 and analytical methods are in Appendix J. All potential impacts are related to the health and safety of populations and hypothetical maximally exposed individual members of the general public and workers. This summary includes estimated impacts from loading operations, incident-free transportation, and